



Transmitted by the expert from Poland

Informal document GRE-74-23
(74th GRE, 20-23 October 2015,
agenda item 10(b))

EXPLANATIONS to **GRE-74-11**

Reg. 112 - optional Class B1 headlamp

Poland

74 GRE 20-23 October 2015



Descriptions of photometrical requirements for headlamps (Reg. 112) are based on

PARABOLOID

design

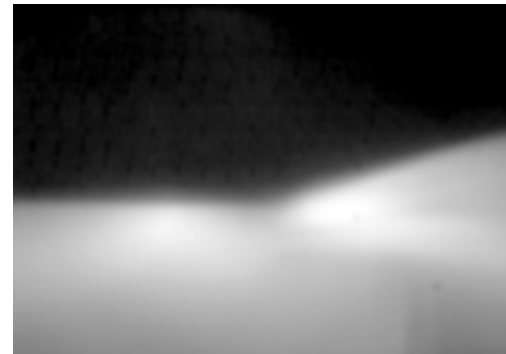
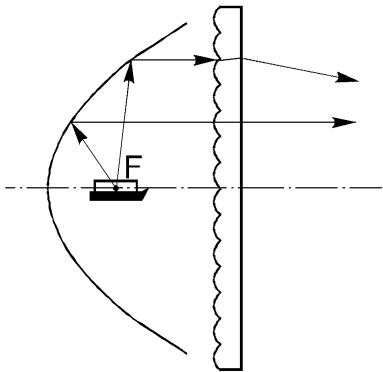


DESIGN FACTORS

At the beginning of UN ECE Regulation system (1958) there were significant restrictions of design:

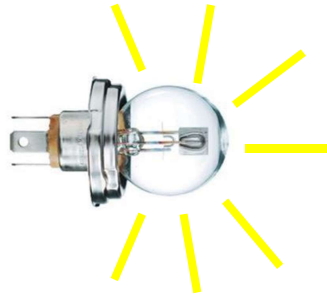
- **PARABOLOID** DESIGN ONLY
- **FIXED FLUX** OF FILAMENT (450 lm)
- SPECIAL AND **PREDICTIVE LIGHT DISTRIBUTION**

Uniform, slightly divergent and finished by horizontal rays deflection of front lens

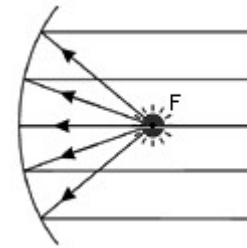


FIXED DESIGN FACTORS

**INFLUENCING LIGHT DISTRIBUTION AND QUALITY OF ROAD ILLUMINATION
BESIDES TYPE APPROVAL REQUIREMENTS**

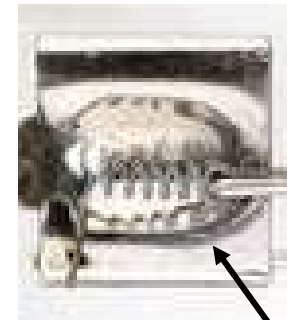


**LUMINOUS FLUX
OF LIGHT SOURCE**

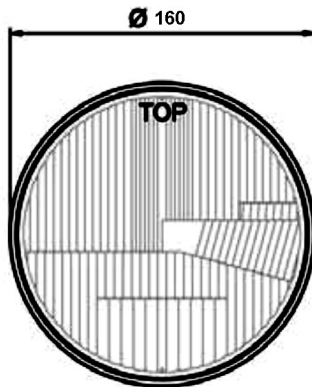


**FOCAL DISTANCE
BETWEEN LIGHT SOURCE
AND REFLECTOR**

**GEOMETRICAL
SHAPE AND SIZE
OF FILAMENT**

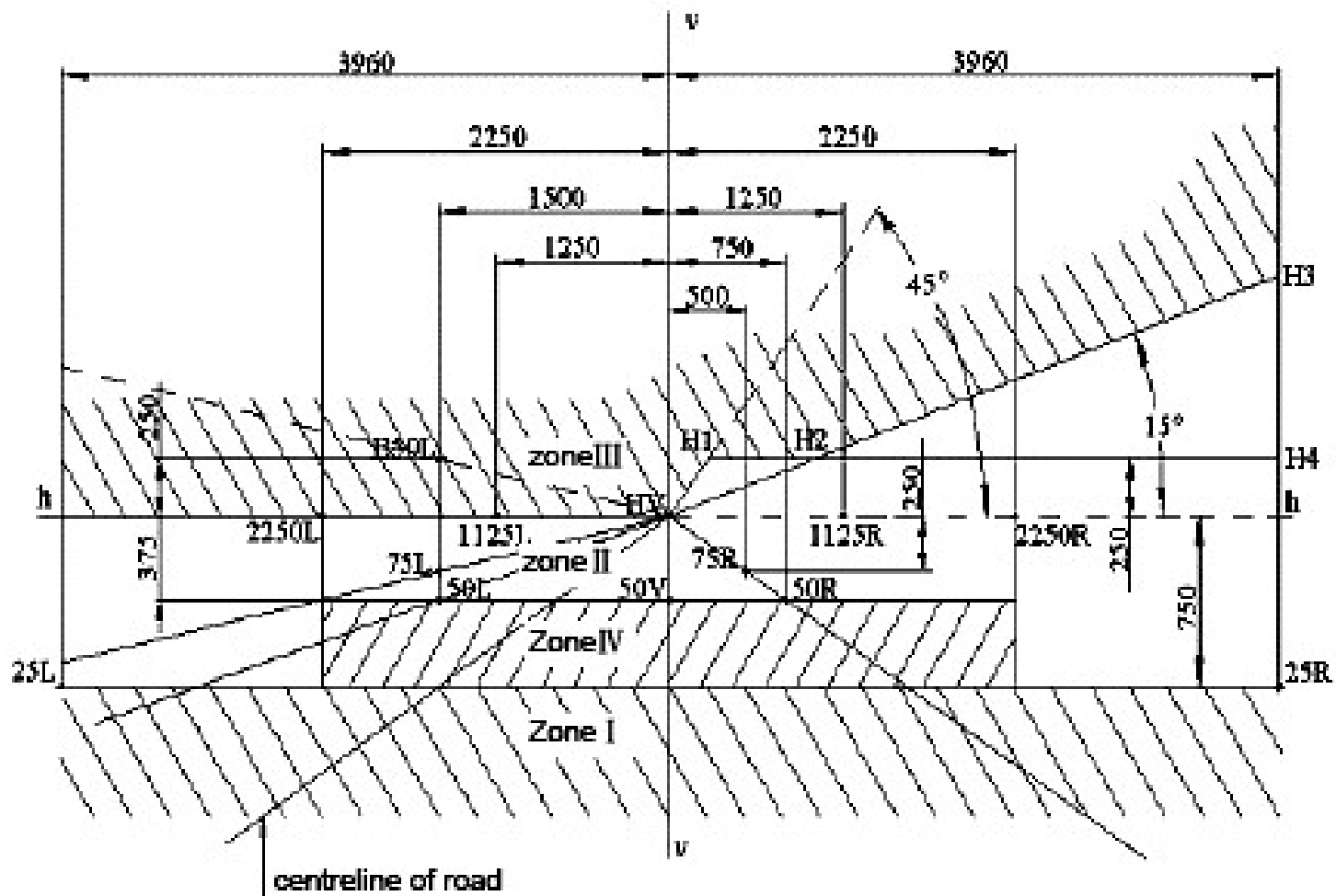


Shield for CUT-OFF

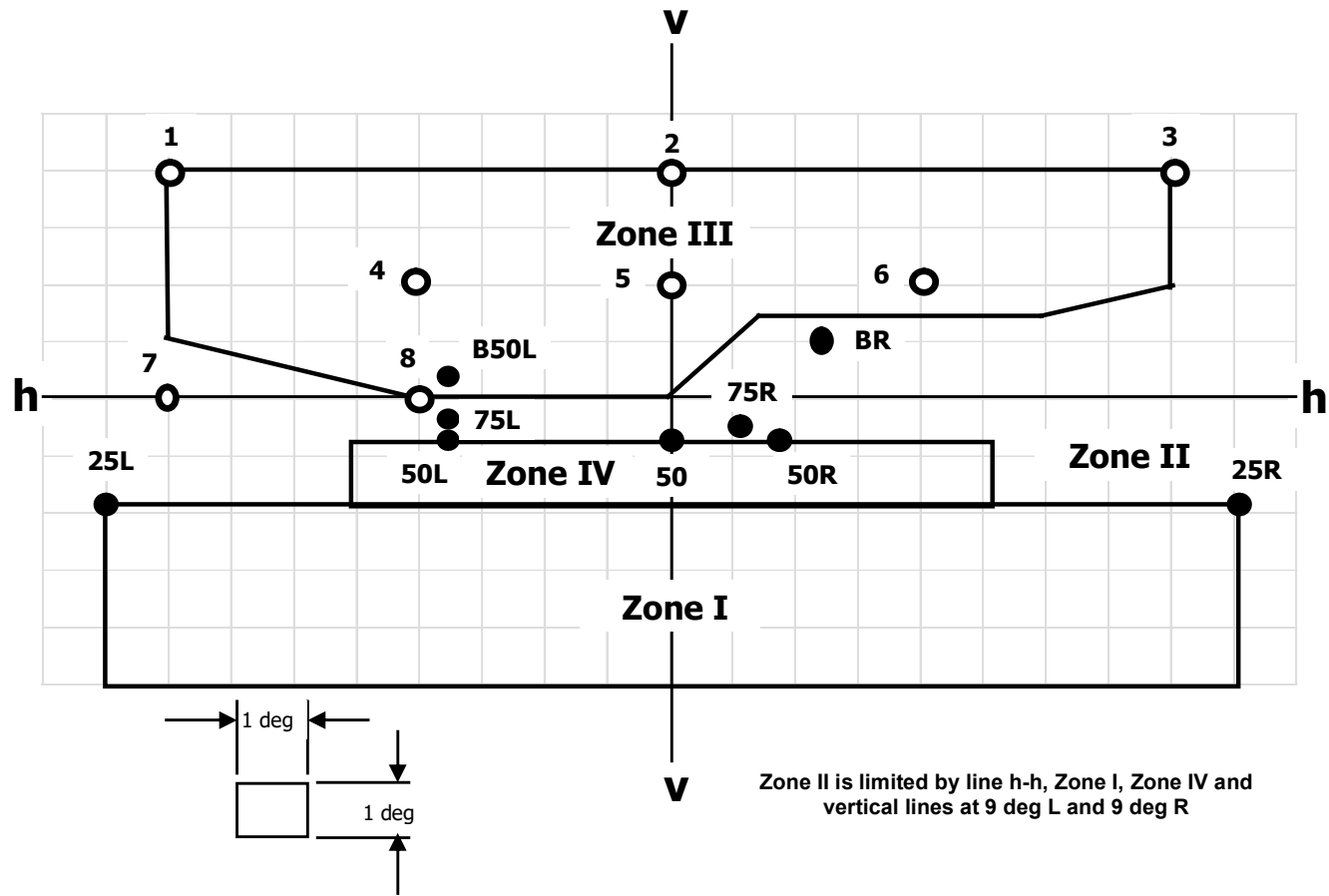


**GEOMETRICAL SIZE
OF HEADLAMP**

USE OF „**STANDARD**” **HEADLAMP** (an effective diameter not less than 160 mm)
AND „**ETALON**” BULB

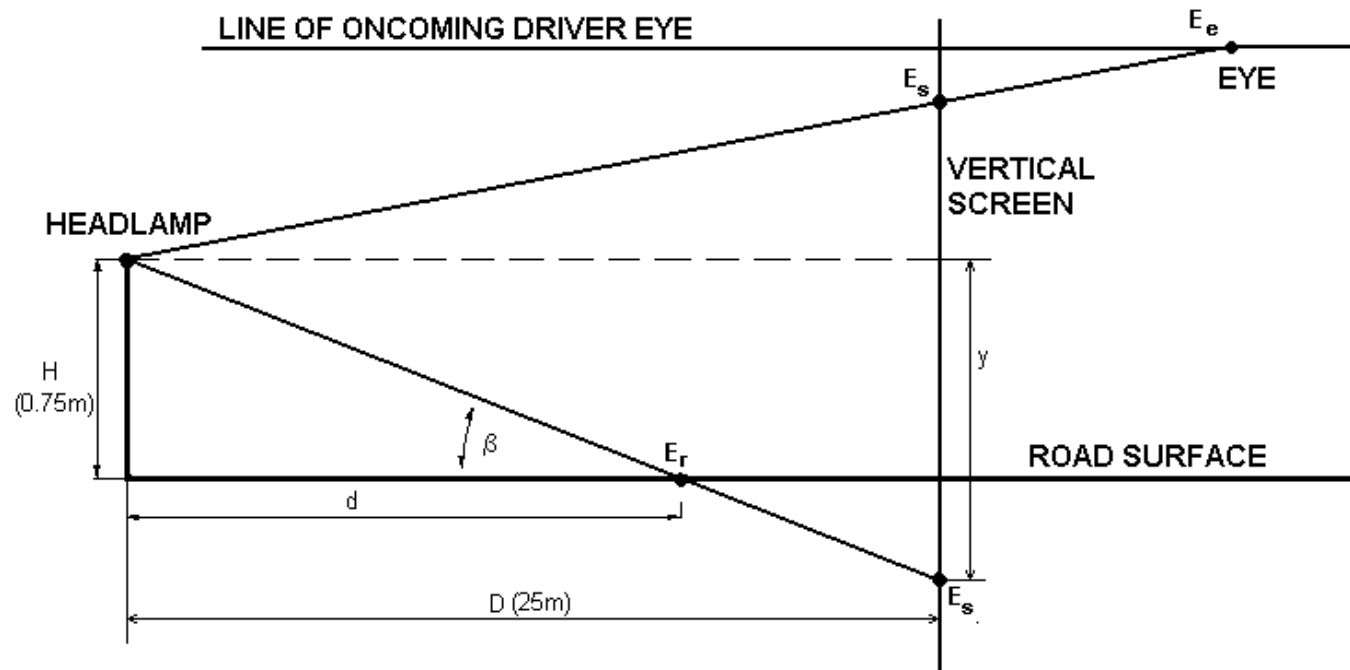


The Regulation originally described values for vertical screen co-ordinate system



... recently converted to angular co-ordinate system (for measuring purpose only)

Relationship between screen and road illumination



$$E_s = E_r \cdot d^2 / 625$$

Where:

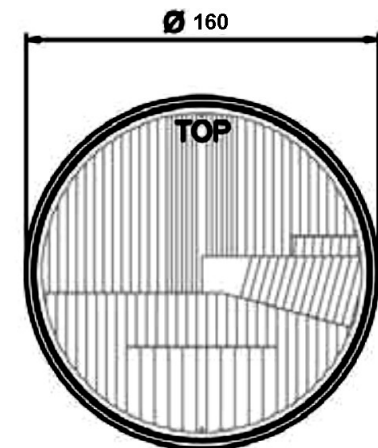
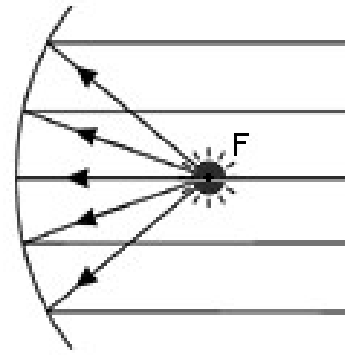
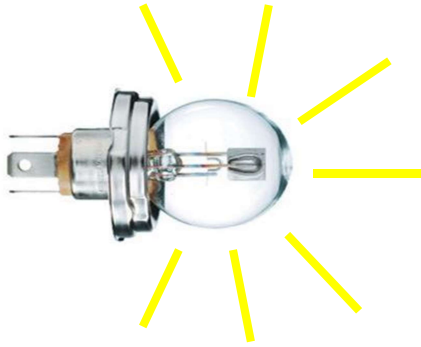
E_s - equivalent screen illumination in [lx]

E_r - required road illumination in [lx]

d - distance on the road in front of the vehicle in [m]

FIXED DESIGN FACTORS

Significant simplifications included in
the mathematical model
but **not expressed** the Regulation

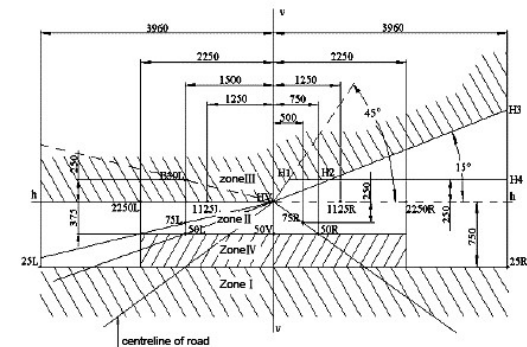


Finally the present photometric requirements are

SIGNIFICANTLY SIMPLIFIED

and

MATCHED TO PARABOLOID TECHNOLOGY



TECHNICAL PROGRESS

allow for much better shaping the beam pattern

but

PHOTOMETRIC REQUIREMENTS

DO NOT SUFFICIENTLY REPRESENT*

ROAD ILLUMINATION QUALITY

** Especially for newest technology (LED, laser, matrix, pixel lighting, etc)*

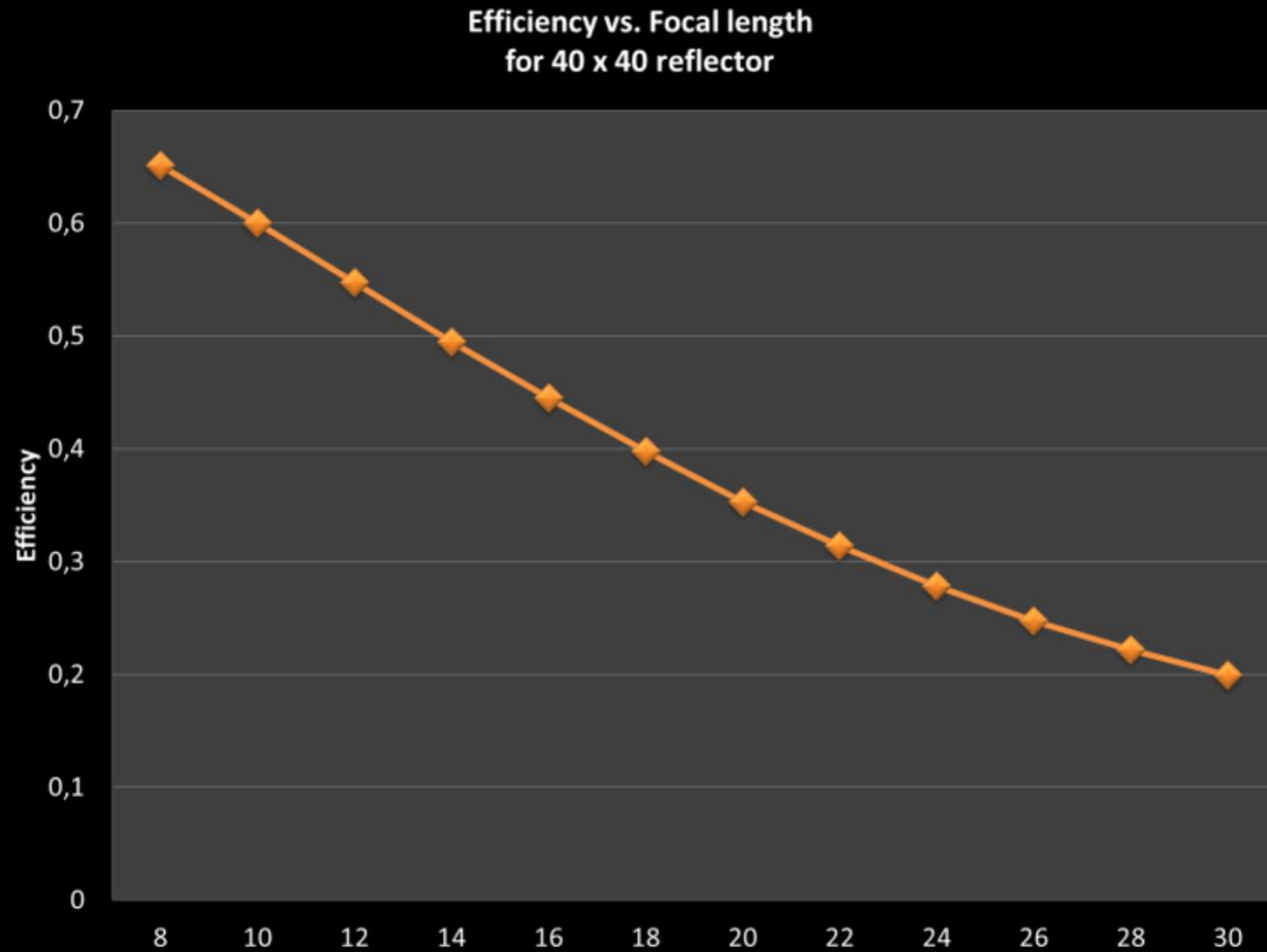
LAST RESEARCH RESULTS:

Scholl M. "Free Fall of LED System Efficiency – Performance Evaluation of current LED Headlamps", International Symposium on Automotive Lighting ISAL 2015, Darmstadt

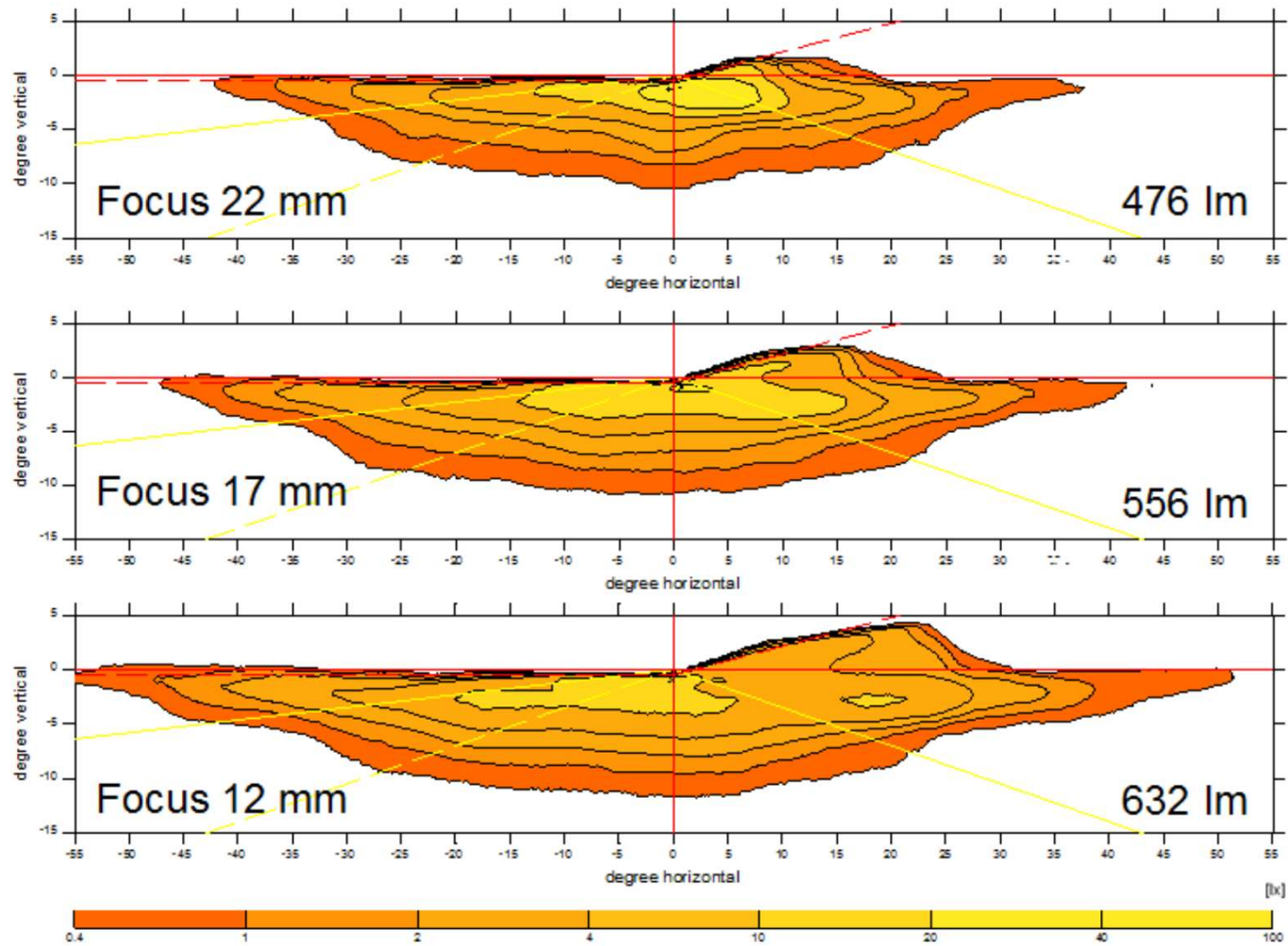
**11th International Symposium
on Automotive Lighting**

Darmstadt
September 29–30, 2015





Efficiency for a reflector as a function of the **focal length** (40x40 reflector size equipped with a 1mm² LED light source) – [Scholl]



Low beam pattern for a 60x60 reflector with different focal length – [Scholl]

CLEAR EVIDENCE

that for presented LED technology
increased flux output and **headlamp efficiency** will lead to
impaired performance

MOREOVER

Increased efficiency might be be motivation to
further reduction the light source flux
and further impairment of the worst light distribution

CONCLUSIONS

For all kind of headlamps there are important relations between:

- flux,
- light source size and shape,
- focal length,
- reflector size

Finally present screen-like requirements do not represent quality and performance of beam pattern appropriately.

Flux emitted by headlamp is also not appropriate quality/safety criterion.

PROPOSAL

PERFORMANCE FACTOR

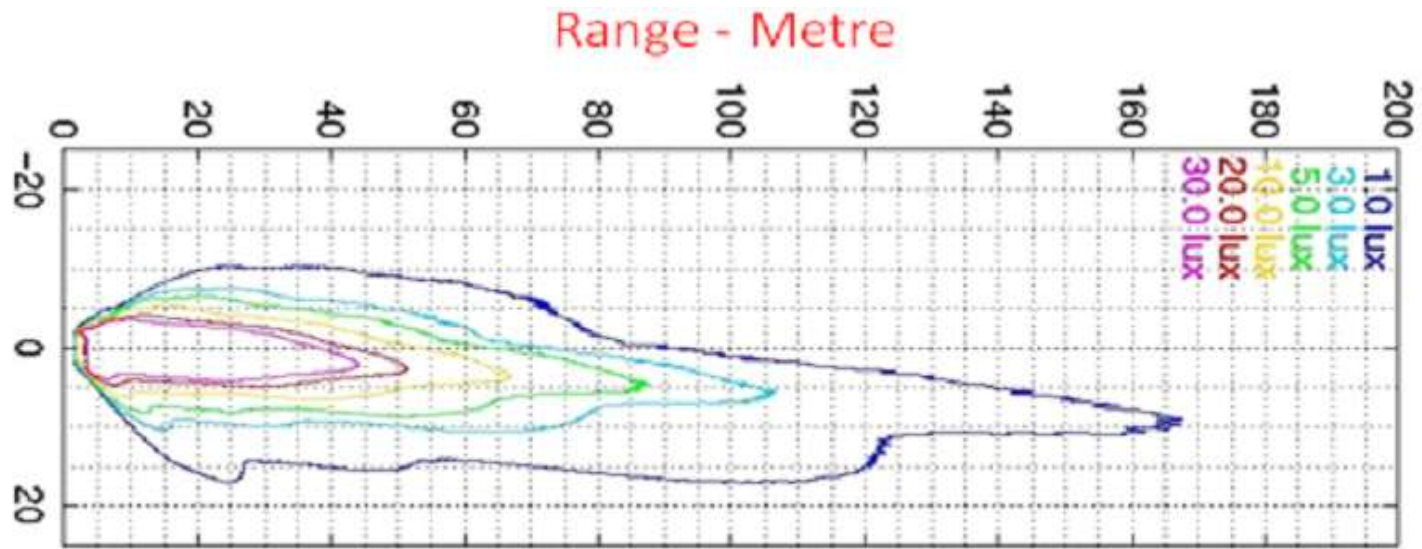
which can guarantee road illumination and safety
(no flux, no luminous intensity)

For passing beam **performance representative factor**
is the vertical illumination at the road surface
in areas where the object important for safety are present.

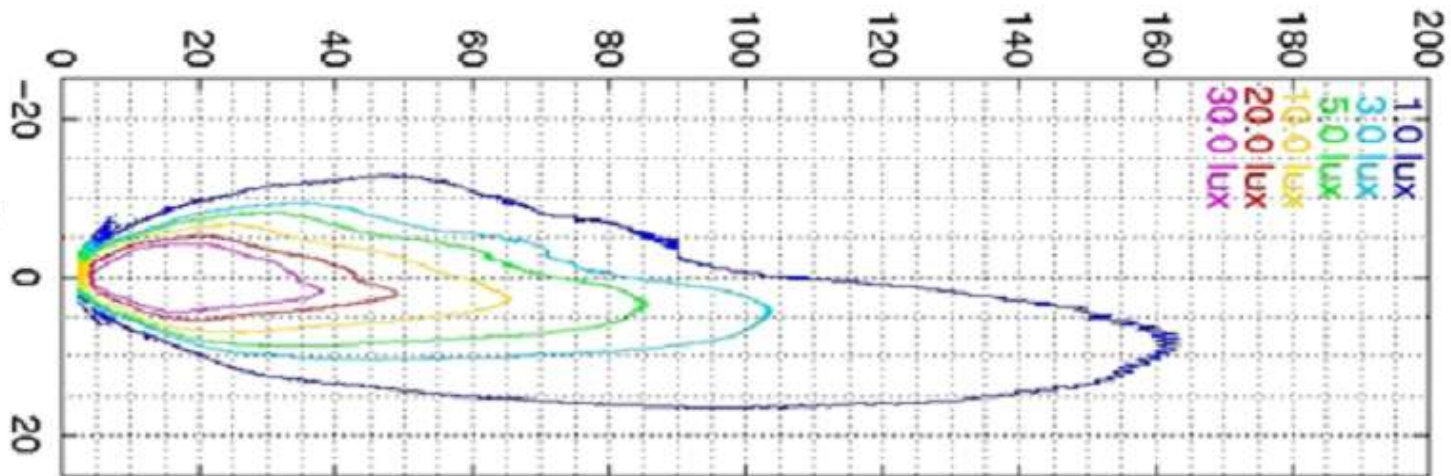
PROPOSAL

OPTIONAL Class B1 headlamp

Performance equivalent to road illumination quality provided
by
contemporary halogen headlamps
according CIE TC 4-45 standard

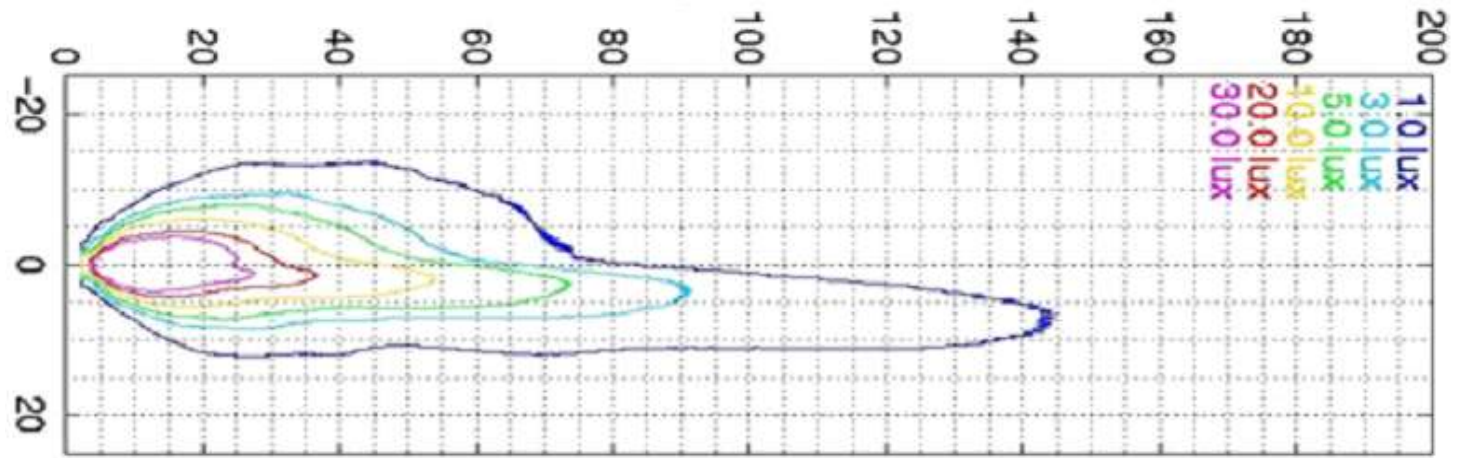


Headlamp System 1

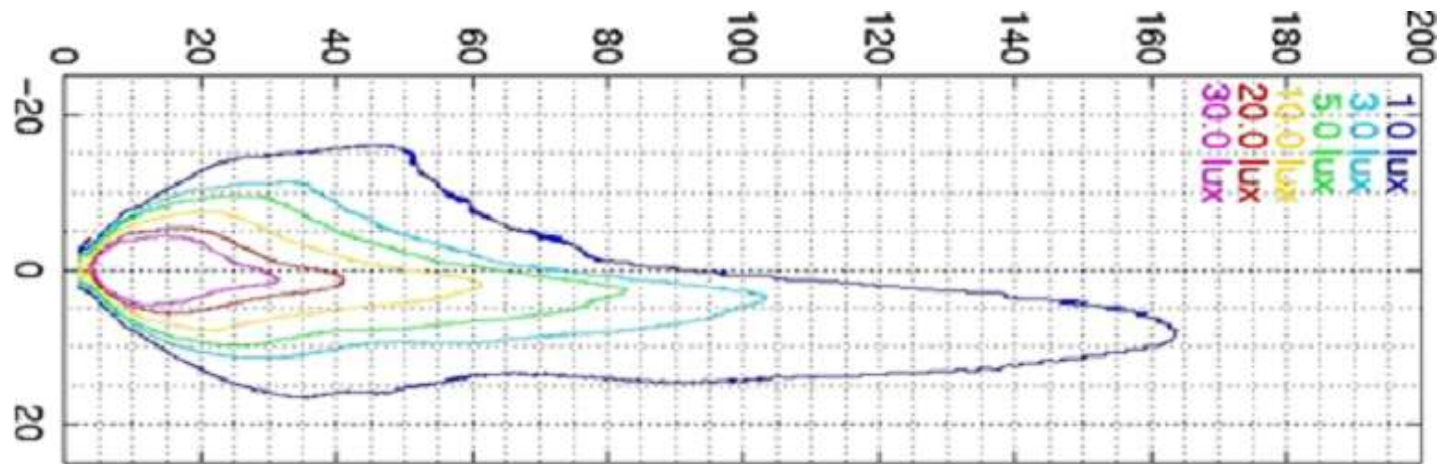


Headlamp System 8

HALOGEN HEADLAMPS MEASUREMENTS WHICH WERE THE BASE FOR TC4-45

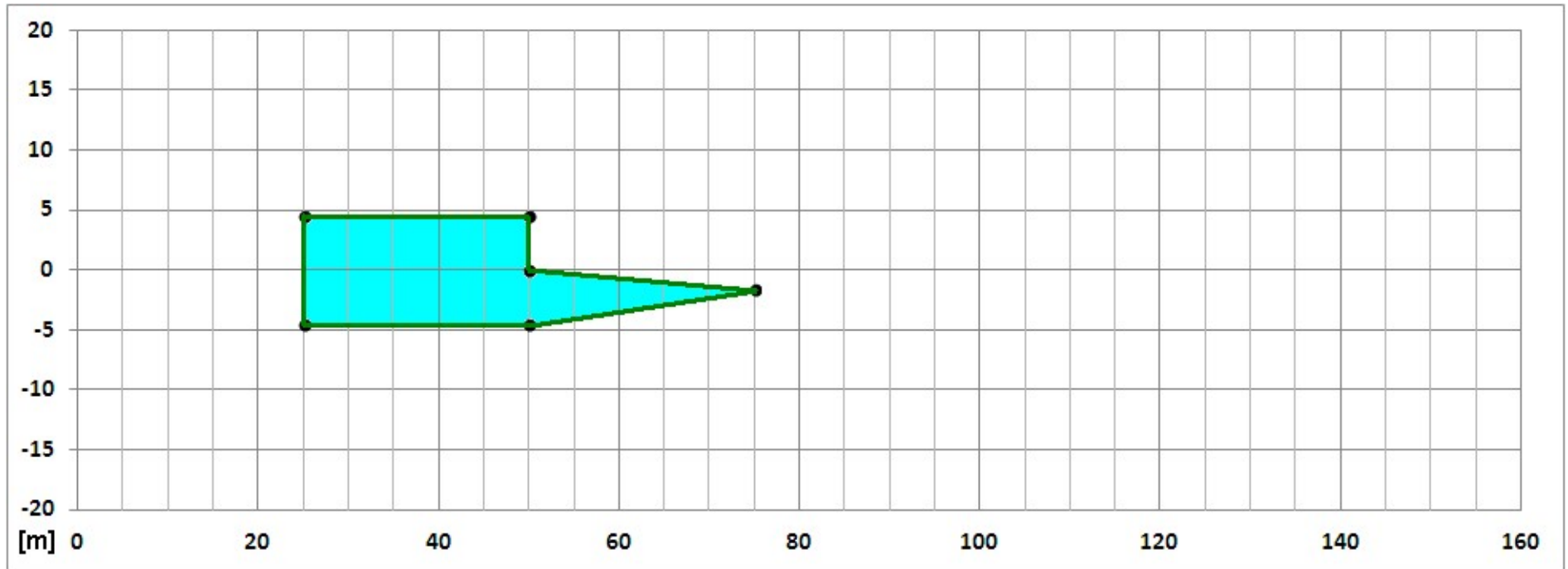
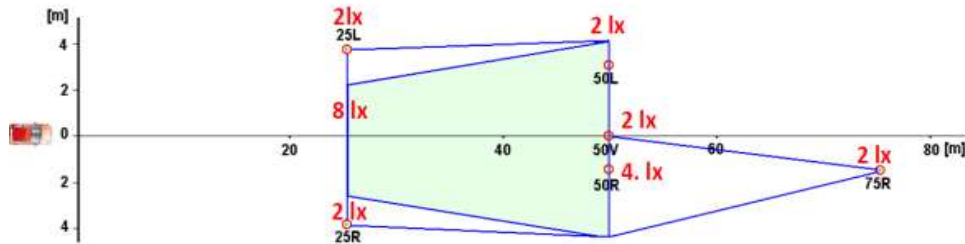


Headlamp System 9



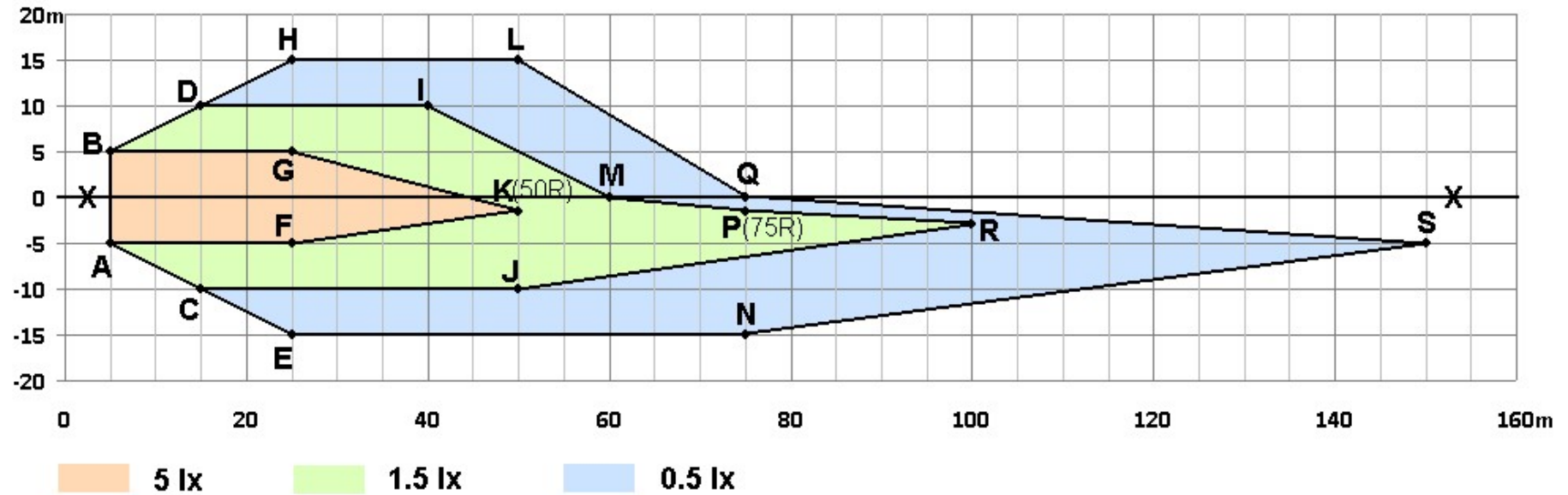
Headlamp System 14

HALOGEN HEADLAMPS MEASUREMENTS WHICH WERE THE BASE FOR TC4-45



Rer. No. 112 MINIMUM REQUIREMENTS - ROAD TRANSLATION

ESSENCE OF PROPOSAL



There are proposed three values according CIE standard 1lx and 3lx for “range” and “width” and 10 lx for central and foreground area (for pair of headlamps values will multiply by 2).

ADVANTAGES OF PROPOSAL

- No light source flux requirements
- True performance based requirements
- No technology discrimination
- Optional. No obligation to follow

LABORATORY MEASUREMENT

There is no need to describe values on the screen

They can be simply recalculated (mapped) for photogoniometric system whilst measurements will be done identically as till now.

For measurements of the areas described above the random procedure may be used for reduction the quantity of measurements.

Any equivalent measuring method may be used under condition to guarantee result as described.



**THANK YOU FOR YOUR
ATTENTION**

